

**REMARKS****Statement of the Substance of the Interview**

The undersigned would like to thank the Examiner for his courtesy and cooperation extended during the December 30, 2008 telephone interview. As indicated in the Interview Summary, the claims were discussed in view of the *Yorikatsu* and *Tsutomu* references. Applicants' representative requested clarification concerning the Examiner's position that the references were combinable and taught cesium vanadate as an oxidizer in an alkali metal generating agent. The Examiner agreed to reconsider the rejection in light of the arguments. In addition, Applicants' representative proposed providing Experimental results to show the differences between an alkali metal generating agent using chromate and one using vanadate. The Examiner confirmed that such results would provide extra weight to patentability of the claims.

**Summary of the Office Action**

Claims 1-4, 6-7, 11-17, and 25-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu et al.* (U.S. Patent No. 3,658,713) (hereinafter "*Yorikatsu*") in view of *Tsutomu et al.* (Japanese Patent Application 06-231727) (hereinafter "*Tsutomu*").

Claims 5 and 23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and further in view of *Suzuki* (Japanese Patent Application 55-078436) (hereinafter "*Suzuki*").

Claims 8-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and further in view of *Suyama et al.* (U.S. Patent No. 6,198,221) (hereinafter "*Suyama*").

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and *Suzuki* and further in view of *Suyama*.

Claims 18, 20-22, and 29-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and further in view of Bradley (U.S. Patent No. 3,761,614) (hereinafter "*Bradley*").

Claim 19 and 32-34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and further in view of *Bradley* and further in view of *Suzuki*.

Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yorikatsu* in view of *Tsutomu* and in view of *Suzuki* and further in view of *Bradley*.

These rejections are respectfully traversed for at least the following reasons.

#### **All Claims Define Allowable Subject Matter**

Claims 1-4, 6-7, 11-17, and 25-28 are rejected under 35 U.S.C. § 103(a) as being allegedly obvious over *Yorikatsu* in view *Tsutomu*. Applicants respectfully traverse the rejection.

Applicants submit that using the claimed invention as a roadmap to find its prior art components is impermissible hindsight reasoning. See, e.g., W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d. 1540, 220 USPQ 303 (Fed. Cir. 1983). The "as a whole" assessment of the invention requires a showing that one of ordinary skill in the art at the time of invention, confronted by the same problems as the inventor and with no knowledge of the claimed invention, would have selected the various elements in the prior art, and combined them in the claimed manner. The Office fails to provide any rationale for why one of ordinary skill in the art without using the claims as a roadmap, would select the particularly claimed oxidizer comprising

at least one vanadate with an alkali metal ion as a counter cation for an alkali metal generating agent.

In the Office Action, at page 3, the Examiner concedes that (a) “Yorikatsu is silent regarding an oxidizer comprising at least one vanadate with an alkali metal ion as a counter cation,” and relies on *Tsutomu* for that teaching. However, *Yorikatsu* and the claimed invention relate to alkali metal generating agents, whereas *Tsutomu* relates to electron emissive material (See, e.g., the Abstract of *Tsutomu*). There is no reason provided for why one of ordinary skill in the art would select a compound used in a material to emit electrons as an alkali metal vapor emitting material.

Without the knowledge of the claimed invention, one of ordinary skill in the art would at most recognize that cesium chromate is an alkali metal generating agent as described in *Yorikatsu*, and cesium vanadate is an electron emissive material as described in *Tsutomu*. Only when using the claims as a roadmap, would one of ordinary skill in the art select the cesium vanadate used in an electron emissive material of *Tsutomu* and use it in the alkali metal generating agent of *Yorikatsu*.

Further, the alkali metal generating agent requires a reducer to emit alkali metal vapor, whereas an electron emissive material requires that no reducer be present so that electrons can be emitted. *Tsutomu* teaches away from combining the cesium vanadate with a reducer as claimed, because the cesium vanadate would no longer be capable of emitting electrons as desired by *Tsutomu*. Applicants note that the Supreme Court in KSR International Co. v. Teleflex Inc. reaffirmed that the “teaching away” of a feature by a reference is evidence of nonobviousness. (e.g., “Teleflex has not shown anything in the prior art that taught away from the use of Asano.” KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1745 (2007)) Therefore, for at least the

above reasons, one of ordinary skill in the art, without the knowledge of the claimed invention, would not have selected an oxidizer comprising vanadate.

We note that the Examiner in responding to Applicant's previous argument that there is no reason to combine the references, alleges on page 21 of the Office Action that *Tsutomu* discloses that cesium vanadate is used, because it forms a more stable electron emitter. However, *Tsutomu* is comparing cesium vanadate to the conventional electron emitter, cesium compound-immersed nickel base and a negative pole material of vanadium acid cesium. This statement is not germane to whether there is a reason to substitute vanadate for chromate in the alkali metal generating agent of *Yorikatsu*. The statement does not teach one of ordinary skill in the art whether cesium vanadate is an alkali metal generating agent, whether it is more stable than cesium chromate used in *Yorikatsu* during alkali metal vapor emission, or even whether increased stability is relevant to alkali metal generating agents. Accordingly, for the reasons presented above, the Examiner fails to establish a *prima facie* case of obviousness, and thus Applicants respectfully request withdrawal of the claim.

The claimed invention is also unobvious over the cited references for at least the following additional reason. As described in the specification, for example, in Paragraphs [0012] - [0014], the claimed invention relates to an alkali metal generating agent capable of stably generating alkali metal vapor by a redox reaction between the oxidizer and the reducer therein, and the claimed invention can be preferably used to produce a photo-cathode and a secondary-electron emitting surface. In order to obtain such an effect, the claimed invention uses, as an oxidizer, at least one vanadate with an alkali metal ion as a counter cation, such as Cs-vanadate. The vanadate has an oxidizing power weaker than chromate, and thus the redox reaction with the reducer proceeds moderately as compared with the case of chromate. Therefore, the reaction

rates when using vanadate can be easily controlled by adjustment of reaction temperature even after the reaction starts. Namely, in accordance with the claimed invention using a Cs-vanadate, Cs vapor can be generated without rupturing an alkali metal generating agent itself or a case housing the agent. Vanadate also contributes to reducing the property variation between photocathodes or secondary-electron emitting surfaces to be produced.

Experimental results of a comparative experiment are attached to clearly show the difference between the chemical properties of an oxidizer utilizing vanadate compared to chromate. The samples prepared for the experiment, were 3 mm-diameter pellets of  $\text{Cs}_2\text{CrO}_4/\text{Si}$  and  $\text{CsVO}_3/\text{Si}$ . In the prepared  $\text{CS}_2\text{CrO}_4/\text{Si}$  pellet sample, the concentration by weight was 1 : 2 ( $\text{CS}_2\text{CrO}_4$  : Si). The molar weight of  $\text{CS}_2\text{CrO}_4$  was 381.8, and the molar weight of Si was 28.1. The number of moles of  $\text{CS}_2\text{CrO}_4$  was  $2.6 \times 10^{-3}$ , and the number of moles of Si was  $7.12 \times 10^{-3}$ . On the other hand, in the prepared  $\text{CsVO}_3/\text{Si}$  pellet sample, the concentration by weight was 1 : 2 ( $\text{CsVO}_3$  : Si). The molar weight of  $\text{CsVO}_3$  was 231.8, and the molar weight of Si was 28.1. The number of moles of  $\text{CsVO}_3$  was  $4.3 \times 10^{-3}$ , and the number of moles of Si was  $71.2 \times 10^{-3}$ .

In the comparative experiment each of the prepared pellet samples were separately introduced into different sealed glass tubes, each having an inner space maintained in the degree of vacuum from  $1 \times 10^{-6}$  to  $3 \times 10^{-4}$  (Pa). After this, each of the set pellet samples was heated by respectively applying a current of 0.7 A to them. The temperature of the inner space of each glass tube (tube temperature) was measured by a radiation thermometer. The attached drawing shows result of this comparative experiment. In the drawing, the graph plots the values of the tables. As shown in the graph, the reduction of the  $\text{CS}_2\text{CrO}_4/\text{Si}$  pellet sample started after 35 seconds, but Cs-emission finished almost instantly. On the other hand, the reduction of the

CsVO<sub>3</sub>/Si pellet sample started after 20 seconds, and then Cs-emission continued for another 40 seconds.

The duration of Cs-emission is determined by measuring the inner space temperature of the glass tube during Cs-emission. To accurately determine the temperature, infrared must be able to pass from the inner side to the outer side of the tubes. However, a layer of Cs deposited on the inner side of the glass shields the passage of infrared, and thus as the Cs deposition increases the temperature becomes immeasurable. In the Cs<sub>2</sub>CrO<sub>4</sub>/Si pellet sample, after about 35 seconds, which is almost the exact time reduction begins, the inner space temperature of the glass tube cannot be measured (temperature immeasurable condition). On the other hand, in the CsVO<sub>3</sub>/Si pellet sample, Cs-emission progressed slower from the reduction start time to the end of the Cs-emission time span. Since Cs was depositing on the inner wall of the glass tube at a slower rate, the temperature could be measured for a longer period of time. Therefore, because the temperature could be determined for a longer period of time, it is clear the Cs-emission progressed slower when using a CsVO<sub>3</sub>/Si pellet as opposed to Cs<sub>2</sub>CrO<sub>4</sub>/Si.

Furthermore, Applicants respectfully assert that dependent claims 2-34 are allowable at least because of their dependence from independent claim 1, and the reasons discussed previously. With regard to the additionally applied references to various dependent claims, as summarized previously, Applicants respectfully submit that these additionally applied references do not cure the deficiencies discussed previously with regard to *Yorikatsu* and *Tsutomu*.

**CONCLUSION**

In view of the foregoing, Applicants respectfully request reconsideration and the timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response; the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.

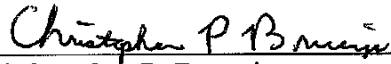
**EXCEPT** for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. § 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0573. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a) (3).

Respectfully submitted,

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**Experimental Results Attachment**

Attached results from Experiment comparing alkali metal generating agents performed by Applicants. One agent using cesium chromate as the oxidizer and the other using cesium vanadate.



# DRAWING: REDUCTION EXPERIMENT BY PELLET HEATING

## Cs<sub>2</sub>CrO<sub>4</sub>/Si

SECOND	°C	DEGREE OF VACUUM (Pa)
0	UFL	$3.10 \times 10^{-08}$
5	UFL	
10	383	
15	498	
20	579	
25	655	
30	721	$3.00 \times 10^{-05}$
35	760	$1.50 \times 10^{-04}$
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		

REDUCTION  
START TIME →

TEMPERATURE  
UNMEASURABLE  
CONDITION

## CsVO<sub>3</sub>/Si

SECOND	°C	DEGREE OF VACUUM (Pa)
0	UFL	$2.50 \times 10^{-06}$
5	350	
10	271	
15	726	
20	776	$1.90 \times 10^{-05}$
25	573	
30	580	
35	595	$2.10 \times 10^{-05}$
40	612	
45	622	
50	629	
55	633	
60	635	
65		
70		
75		
80		
85		
90		
95		

REDUCTION  
START TIME →

TEMPERATURE  
UNMEASURABLE  
CONDITION

